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# Redistributive Equity in Canada: Taxation and Government Expenditures

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# REDISTRIBUTIVE EQUITY IN CANADA: TAXATION AND GOVERNMENT EXPENDITURES

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## I. INTRODUCTION

In order to evaluate the equitability of a tax system one must look not only at taxes themselves but, further, to the tax system in relation to the other burdens imposed and benefits granted by the public sector of the economy. Taxes are but one way in which governments control income; a meaningful commentary on the overall equitability of a tax system must, therefore, include an examination of not only the effects of taxes, but also of the effects of government expenditures. Failure to examine both of these effects, as well as their interaction, may lead to misleading and incorrect conclusions when evaluating the equitability of a given system and, in particular, the degree to which it promotes or fails to promote overall redistributive equity. For example, a tax system which claims a higher percentage as income rises (a "progressive system"), when combined with government expenditures heavily biased in favour of the wealthier classes, might promote less redistribution than the combination of a tax system which holds the percentage of income claimed for tax constant (a "proportional system") and expenditures made specifically on behalf of the poor. Severe criticism based upon this idea has been leveled at the Carter Report;[1] that report considered equity in terms of the amorphous concepts of "vertical" and "horizontal" equity which are defined only with reference to the system of taxation:[2]

> It must be concluded that it is presumptuous of the Carter Commission to claim that their tax proposals are equitable in any meaningful sense without specifying the expenditures side of the budget. . . . If the Carter Commission had really been concerned about equity, they might have recommended greater emphasis on expenditures (even though their terms of reference may have precluded a detailed analysis of expenditures). . . .[3]

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[1] Can. 1 *Report of the Royal Commission on Taxation* (*Carter Report*) (Ottawa: Queen's Printer, 1966).

[2] The Carter Commission asserted that "[e]quity has two dimensions. Horizontal equity requires that individuals and families in similar circumstances bear the same taxes. Vertical equity requires that those in different circumstances bear appropriately different taxes . . .": *id.* at 4-5.

[3] A. Robinson, "The Concept of Equity in the Carter Report," in A. Robinson and J. Cutt, *Canada's Tax Structure and Economic Goals* (Toronto: Faculty of Administrative Studies, York University, 1967) at 13.

It is necessary to consider how equity can be defined taking into account government expenditures as well as taxes. This broader frame of reference focuses upon the crucial issue of the degree of overall redistributive equity[4] effected by the Canadian public sector rather than the far less significant issue of the degree of overall vertical equity in the Canadian tax system.

The most recent and rigorous Canadian study is that of Dr. Irwin Gillespie.[5] He treated overall redistributive equity in terms of income redistribution. He concluded that "[d]uring 1969 [the most recent year surveyed in the study] the total public sector was broadly redistributive from higher income classes to lower income classes."[6]

This paper will analyze the general approach as well as some of the assumptions underlying the Gillespie study. While the results of this analysis do not contradict the trends reflected in Gillespie's conclusions, they do underline the fact that the degree of these trends should be regarded with considerable caution.

This paper will also consider overall redistributive equity in terms of the redistribution of benefits as opposed to the redistribution of income. The concept of the redistribution of benefits takes into account the fact that the value or worth of a government service or good to a recipient tax unit may vary with the income of that tax unit. When overall redistributive equity is considered in terms of redistribution of benefits rather than redistribution of income, a different picture emerges—the public sector appears to be favouring the rich and the poor at the expense of the middle class.

This paper will be divided into three parts. The first will explain briefly how the gross cost of the tax system to different income groups can be measured. The second deals with the problem of quantifying the flow of government expenditures and their benefits to different income groups. The conclusions from these parts will be compared in the third.

## II. THE GROSS COST OF THE TAX SYSTEM

The gross cost of the tax system to a given group is the total tax that it actually bears. This is determined by aggregating all the component taxes to which it is subject. The computation must take into account not only taxes levied directly on the group but also the effects of tax "shifting"; a tax which

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[4] Redistributive equity will be considered only in terms of the short-run impact of the public sector. The long-run impact of the public sector on redistributive equity through its effects on the distribution of wealth, equality of opportunity, etc., will not be treated directly.

[5] A summary and discussion of the results of this study can be found in I. Gillespie, *On the Redistribution of Income in Canada* (1976), 24 Can. Tax J. 417 [hereinafter Gillespie].

[6] *Id.* at 435.

is levied on the group but actually borne by other groups must be excluded from the tax burden of the group upon whom the tax was originally levied and included in the total tax burdens of the groups actually bearing the tax. For example, that portion of the corporate income which is effectively shifted to consumers by way of higher prices should be considered to be part of the consumers' tax burden, rather than part of the tax burden of corporations or their shareholders (except, of course, to the extent that their shareholders are also consumers).

The sum of all the component taxes to which a group or tax unit[7] is subject after the shifting, if any, of each such tax has been taken into account is called the total tax "incidence" on that group or unit.

The "broad income" of a family is essentially a comprehensive measure of the income of a tax unit excluding the effects of the public sector. It is composed of the family's money income (excluding government transfer payments) plus imputed income from such sources as food grown and consumed on the farm. Also included in broad income are inheritances, gifts, and certain accrued gains that may not yet have been converted into cash in the family's hands, such as its share of retained corporate earnings. Direct taxes should not be subtracted in calculating broad income. Furthermore, indirect taxes should be added back in when calculating broad income since income is effectively lessened by the amount of such taxes and broad income is income in the absence of taxes and government expenditures.[8] Since broad income excludes the effects of the public sector, it is a comprehensive measure of income before tax (and before government expenditures). The total effective rate of tax on families with money incomes within a given range is

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[7] The family is assumed to be the tax unit in this paper.

[8] A quantitative example of the calculation of broad income can be found in Gillespie, *supra* note 5, at 444 (Table A-6—Estimation of Income Concepts, Canada, 1969). Unfortunately, Gillespie omits to add back certain indirect taxes such as the shifted portion of the corporate income tax and the federal sales tax levied at the manufacturing level. Consequently, Gillespie generally underestimated broad income by about 15 percent. In this paper, this underestimation has been corrected by adding the indirect business taxes paid by each income class to Gillespie's estimate of their broad income. The resultant sums are the estimates of broad income used in this paper. The added-in factor of indirect business taxes corresponds to the concept of "hidden purchasing power loss" found in: M. Walker, ed., *How Much Tax Do You Really Pay?* (Vancouver: Fraser Institute, 1976). The estimation of income concepts in the technical report underlying that book (see: S. Star and S. Pipes, *Income and Taxation in Canada, 1961-75 (Fraser Institute Technical Report 76-01)* (Vancouver: Fraser Institute, 1976)) corresponds closely to Gillespie's estimates. Thus, it was possible to derive from that technical report an appropriate series of factors representing indirect business taxes that could be added to Gillespie's broad income estimates. This was done by taking the difference of lines 38 (Total Full Income Plus Indirect Business Taxes) and 29 (Full Income) of Table 3-4, found at pages 38(a) and 38 of that technical report.

It should be noted that any attempt to measure income excluding the effects of the public sector will suffer from the problem of how to properly exclude indirect effects of the government on income through such factors as legislation affecting equality of opportunity and the impact of the public sector on the size of the total income "pie" available.

defined as the ratio of the total tax incidence on them to their aggregate broad income.[9]

The concepts of tax incidence and the total effective rate of tax will be indispensable in the portion of this paper that deals with the interaction of taxes and the flow of government expenditures and their benefits. Bearing in mind the previously discussed qualifications upon the significance of an analysis of tax incidence in isolation, it is interesting to briefly consider some of the patterns that emerge when the technique just described is used to calculate effective tax rates (see Table 1).[10]

We see, for example, that personal income tax[11] (lines 1 and 9 of the table) is mildly progressive over all income classes. The corporate income

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[9] This definition can be illustrated as follows:

Assume that the tax mix is made up of "m" different types of taxes (e.g., personal income tax, corporate income tax, sales tax, etc.) and that we have divided family money income into "n" different classes. Let "i" represent the "$i^{th}$" type of tax ($1 \leq i \leq m$) and "j" represent the "$j^{th}$" family money income class ($1 \leq j \leq n$).

Let $t_{ij}$ represent the tax incidence on the $j^{th}$ money income class of the $i^{th}$ type of tax. If we let aggregate broad income for the $j^{th}$ family money income class equal "$Y_j$", then the ratio $t_{ij}$ (x 100)/$Y_j$ gives the effective tax rate (in percentage terms) of the $i^{th}$ type of the tax on the $j^{th}$ family money income class. Similarly, where $\sum_{i=1}^{m} t_{ij} = T_j$; $T_j$ (x 100)/$Y_j$ equals the total effective tax rate (in percentage terms) of the whole tax mix on the $j^{th}$ money income class (which, of course, is the same as the average total effective tax rate of the whole tax mix on a tax unit in the $j^{th}$ money income class).

[10] This table is derived directly from Gillespie's Table 1—Tax Incidence: Effective Tax Rates Using the Broad Income Concept, Canada, 1969, *supra* note 5, at 424. Since the table shows 1969 results, classes appear unrealistically low when we look at them now. In order to put the income class indices in perspective, they are also shown in terms of 1969 percentage and percentile distributions taken from line 2 of Gillespie's Table A-6—Estimation of Income Concepts, Canada, 1969, *supra* note 5, at 444.

The effective tax rates in Gillespie's table are higher than those in the table of effective tax rates shown in this paper. This is due solely to the fact that our estimates of broad income (the denominator of effective tax rates) are larger than Gillespie's, as explained in note 8, *supra*. Our Table 1 embodies the same trends and tax shifting assumptions as Gillespie's Table 1.

Regarding the effects of shifting, Gillespie qualifies his use of "standard shifting assumptions" (which are justified only as being "based on fairly widespread acceptance in the literature": *Supra* note 5, at 423, n. 9) as follows:

> . . . Experimentation with alternative shifting hypotheses for taxes (about which there is still some debate in the literature) resulted in no change in the general pattern of total tax incidence, although there was some change in the magnitudes of effective tax rates. If it is assumed that the corporate profits tax is borne entirely by shareowners, total tax incidence is less regressive over the lower income brackets and slightly less regressive over the upper income brackets. If it is assumed that sales and excise taxes are borne by factory owners, total tax incidence is considerably less regressive over the lower income brackets and virtually proportional over the upper income brackets. If it is assumed that the share of property tax failing on renter-occupied housing units is borne by the landlord rather than by the tenant, total tax incidence is slightly less regressive over the upper income brackets.

[11] It is assumed that personal income tax is not shifted: Gillespie, *supra* note 5, at 441 (Table A-5—Shifting Assumptions for Fiscal Incidence Study).

## TABLE 1

EFFECTIVE TAX RATES IN PERCENTAGES FOR 1969

| | | *Family Money Income Class* under $2,000 | $2,000–$2,999 | $3,000–$3,999 | $4,000–$4,999 | $5,000–$5,999 | $6,000–$6,999 | $7,000–$9,999 | $10,000–$14,999 | $15,000– & Over | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | PERCENTAGE DISTRIBUTIONS OF FAMILY UNITS IN EACH FAMILY MONEY INCOME CLASS | 12.3 | 8.0 | 7.8 | 7.6 | 8.0 | 7.9 | 22.0 | 18.2 | 8.3 | 100.0 |
| | (CUMULATIVE) PERCENTILE DISTRIBUTION OF FAMILY UNITS IN EACH FAMILY MONEY INCOME CLASS | 12.3 | 20.3 | 28.1 | 35.7 | 43.7 | 51.6 | 73.6 | 91.8 | 100.0 | |
| LINE | TAX | | | | | | | | | | |
| | FEDERAL TAXES | | | | | | | | | | |
| 1 | Personal Income Tax | 1.7 | 2.4 | 3.4 | 4.4 | 5.6 | 6.3 | 7.5 | 9.3 | 9.5 | 7.9 |
| 2 | Corporation Income Tax | 7.8 | 4.2 | 3.2 | 3.0 | 2.0 | 2.7 | 2.1 | 2.1 | 4.2 | 2.8 |
| 3 | General Sales Taxes | 11.2 | 6.3 | 4.7 | 4.1 | 3.8 | 3.7 | 3.5 | 3.2 | 2.2 | 3.2 |
| 4 | Selective Excise Taxes | 4.5 | 2.5 | 2.0 | 1.7 | 1.8 | 1.6 | 1.4 | 1.3 | .7 | 1.3 |
| 5 | Social Security Taxes | 2.4 | 2.3 | 2.9 | 3.5 | 4.0 | 3.5 | 3.1 | 2.3 | 1.0 | 2.4 |
| 6 | Customs Import Duties | 4.1 | 2.2 | 1.6 | 1.4 | 1.4 | 1.4 | 1.3 | 1.2 | .8 | 1.2 |
| 7 | Succession and Estate Taxes | .4 | .3 | .3 | .2 | .1 | .1 | .1 | .1 | .3 | .2 |
| 8 | Total Federal Taxes | 32.2 | 20.1 | 18.1 | 18.3 | 18.6 | 19.4 | 18.9 | 19.4 | 18.7 | 18.9 |
| | PROVINCIAL TAXES | | | | | | | | | | |
| 9 | Personal Income Tax | .7 | .9 | 1.4 | 1.7 | 2.1 | 2.5 | 2.9 | 3.6 | 3.6 | 3.1 |
| 10 | Corporation Income Tax | 2.9 | 1.5 | 1.2 | 1.0 | .8 | .9 | .8 | .8 | 1.4 | 1.0 |
| 11 | General Sales Tax | 7.5 | 4.9 | 4.1 | 2.9 | 2.9 | 2.7 | 2.5 | 2.4 | 1.5 | 2.4 |
| 12 | Selective Excise Taxes | 6.1 | 3.9 | 3.2 | 3.2 | 3.2 | 3.1 | 2.9 | 2.6 | 1.4 | 2.5 |
| 13 | Social Security Taxes | .3 | .2 | .3 | .3 | .3 | .4 | .4 | .3 | .2 | .3 |
| 14 | Medical-Hospital Premiums | 7.5 | 2.7 | 1.8 | 1.4 | 1.4 | 1.1 | .9 | .8 | .5 | .9 |
| 15 | Succession and Estate Taxes | .6 | .3 | .3 | .3 | .2 | .2 | .1 | 1. | .3 | .2 |
| 16 | Other Taxes | 4.5 | 2.6 | 1.9 | 1.8 | 1.5 | 1.7 | 1.5 | 1.5 | 1.5 | 1.6 |
| 17 | Total Provincial Taxes | 28.0 | 17.2 | 13.9 | 12.7 | 12.3 | 12.7 | 12.0 | 12.0 | 10.5 | 11.7 |
| | LOCAL TAXES | | | | | | | | | | |
| 18 | General Sales Tax | – | – | – | – | – | – | – | – | – | – |
| 19 | Property Tax | 19.2 | 10.8 | 6.4 | 5.2 | 4.5 | 4.3 | 4.0 | 3.6 | 3.0 | 4.0 |
| 20 | Business Tax | 1.5 | .8 | .5 | .3 | .4 | .4 | .4 | .3 | .3 | .3 |
| 21 | Poll Taxes | .1 | – | – | – | – | – | – | – | – | – |
| 22 | Other Taxes | .2 | .1 | .1 | .1 | – | – | – | – | – | – |
| 23 | Total Local Taxes | 20.9 | 11.7 | 6.9 | 5.6 | 4.9 | 4.7 | 4.5 | 4.0 | 3.2 | 4.4 |
| 24 | TOTAL ALL TAXES | 81.3 | 49.0 | 39.1 | 36.5 | 35.9 | 36.7 | 35.4 | 35.4 | 32.4 | 35.0 |

tax[12] (lines 2 and 10) is regressive up to a family money income level of $6,000. Gillespie concludes that:

> . . . The regressivity [of the corporate income tax] over the lower income brackets is caused partly by the portion of the tax that is assumed to be shifted forward to consumers, and partly by the fact that family units in the lowest income brackets (probably the retired elderly), own a larger proportion of corporate shares than those in the middle income brackets do.[13]

Above an income level of $6,000 it would seem reasonable to infer that the pattern of incidence of the corporate income tax is the result of two counter-balancing forces:

i) Wealthier families tend to spend a lower proportion of their income on consumption. Thus, the amount of corporate income tax that has been shifted forward to wealthier consumers will generally be lower relative to their income than in the case of poorer families. This tends to militate against the progressivity of the corporate income tax;

ii) The proportion of corporate shares owned by middle and upper income families tends to rise with income. This would increase the progressivity (or reduce the regressivity, as the case may be) of the corporate income tax.

The combined effect of these factors does not produce an unambiguous trend except where the income level exceeds $15,000. Here factor (ii) appears to predominate to raise the effective rate of corporate income tax paid by this group above that paid by the middle and upper-middle income groups. It is still less than the effective rate of corporate income tax on the group below an income level of $2,000, however, and equal to that of the income group between $2,000 and $3,000.

Property tax (line 19)[14] is regressive over all income levels. Sales tax (lines 3 and 11)[15] and selective excise taxes (lines 4 and 12)[16] are generally

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[12] One half of the corporate income tax is assumed to be borne by the shareholders and is distributed *pro rata* on the basis of dividend income, i.e. the "distributive series" is dividend income, and the other half is assumed to be shifted forward to consumers (distributive series: total consumption): *id.*

[13] *Id.* at 423.

[14] It is assumed that property tax on land is borne by the owners of the land (the distributive series for land used for business is dividend income; for land used for farming it is farming income; and for residential land it is rental income). Property tax on business improvements is assumed to be borne by consumers (distributive series: total consumption) and property tax on farm improvements is assumed to be borne by consumers of food (distributive series: consumption of food). Property tax on improvements on owner-occupied residence is assumed to be borne by the owners (distributive series: value of owned homes) whereas such tax on renter-occupied units is assumed to be borne by renters (distributive series: rent expenditures): *id.* at 441 (Table A-5—Shifting Assumptions for Fiscal Incidence Study).

[15] It is assumed that federal and provincial sales tax is borne by consumers of taxed items (distributive series: consumption of commodities subject to federal and provincial sales tax, respectively): *id.*

[16] Excise taxes are assumed to be borne by consumers of the goods on which they are levied in proportion to the consumption of such goods by each income class: *id.*

regressive at both the federal and provincial levels although proportionality, with some variation, is exhibited between the income levels of $5,000 and $15,000. More importantly, this pattern is followed by the effective tax incidence of the whole tax mix (line 24: "Total All Taxes"). This is not surprising since the generally regressive taxes such as corporate income tax, property tax, sales tax and selective excise taxes accounted for 50 percent of total tax payments in Canada in 1969 (versus 30 percent for personal income tax).[17] Thus, the weight of generally regressive taxes in the tax mix is sufficient to enable their regressiveness to predominate, by and large, over the mild progressivity of personal income tax. The Carter Commission's recommendation that the effective progressivity as well as the weight of personal income tax in the tax mix be increased[18] might serve to promote vertical equity. As will be seen, however, the implementation of these recommendations may, in itself, have little effect on overall redistributive equity, i.e., the redistribution that is effected when both taxes and government expenditures are taken into account.

## III. THE FLOW OF GOVERNMENT EXPENDITURES AND THEIR BENEFITS

The concept of expenditure incidence is analogous to that of tax incidence. It can be used to determine the magnitude of the flow of expenditures from the government to those being governed. The total expenditure incidence on a given group is simply the total government expenditures made for their benefit.

Since the Gillespie study was concerned with the redistribution of income, it dealt with government expenditures in terms of expenditure incidence. An alternative measure of overall redistributive equity can be derived if government expenditures are dealt with using the concept of benefit incidence rather than expenditure incidence.

The concept of benefit incidence goes a step further than expenditure incidence. Whereas expenditure incidence is defined in terms of the cost to the government of providing benefits, benefit incidence is defined in terms of the value or worth (in money terms) to the recipient of benefits provided. The cost to the government of providing a given amount of goods or service will generally not vary with the income of the recipient; however, the value or worth (in money terms) of a good or service to the recipient tax unit will often vary with the income of the recipient. For example, assume that government funding for public schools ceased and that schools were completely taken over by private enterprise. Even if poorer families generally attached the same importance to education as wealthier families, the latter would tend to be willing to pay more to ensure that their children received a good education. Naturally, this would be because wealthier families have more money at their disposition to spend on education. Thus, we would expect the

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[17] *Id.* at 437 (Table A-2—Total Tax Payments, Canada, 1969).

[18] 2 *Carter Report, supra* note 1, at 266.

value of education (in money terms) to generally increase with the income of the family unit. It should be noted, however, that this relationship may not hold in cases where private market substitutes are used. For example, the value (in money terms) of having a public school nearby may be negligible to a wealthy family that sends its children to a private school, whereas to a poorer family whose children attend the public school its value may be substantial.

Having distinguished expenditure incidence and benefit incidence, we consider first expenditure incidence. In order to quantify expenditure incidence, it is necessary to ascertain the portion of government expenditures the benefit of which is actually received by families in each income class. Government expenditures may be broadly divided into two categories for this purpose.

The first category includes all "specific" expenditures for which the flow of primary benefits to the recipient is directly traceable. In Gillespie's paper, the hypotheses used to distribute the ultimate incidence of such directly traceable expenditures are based upon the incidence of use of the benefits flowing from such expenditures.[19]

For example, the proportion of total expenditures on elementary and post-secondary education deemed to be received by a given family money income class is equal to the ratio of students in such families benefiting from such expenditures to the total number of students from all family money income classes benefiting from such expenditures. The allocation of specific expenditures based on use has generally been refined to the point where the probability of significant errors in the estimation of total expenditure incidence using such a basis for allocation is small. This is not to suggest that the hypotheses used approach perfection. They still suffer from the tendency to exclude altogether effects which are difficult to quantify, such as the indirect benefits accruing to society from such services as education and public health.

The second category of government expenditures includes all "general" expenditures on "pure" public goods such as defence and the police. Obviously, it is most difficult to analyze the allocation of such expenditures on the basis of incidence of use. Most general expenditures protect both life and property. To the extent that they protect property, they are directed more heavily toward upper income families and their incidence should be distributed accordingly; however, to the extent that their importance is perceived in terms of protecting the life and personal security (as opposed to the property) of Canadians, it is more appropriate to view general expenditures as being directed equally at families in all income classes. This latter view is adopted in this paper and it is assumed that the portion of general expenditures which should properly be viewed as protecting property is minimal relative to that portion which should be viewed as protecting life. Thus, in determining expenditure incidence, general expenditures have been distributed equally across tax units without regard to their income class.[20] Admittedly, this is a

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[19] These hypotheses are clearly specified in Gillespie's paper, *supra* note 5, at 442 (Table A-5—Shifting Assumptions for Fiscal Incidence Study).

[20] Since the concern here is with the average family in each income class, the effects

simplification since some portion of general expenditures should be allocated on the basis of the property held by each income class. For this reason, we will later consider how the measurement of expenditure incidence might be altered if general expenditures were allocated in proportion to broad income rather than equally across tax units.

Indeed, in deriving "expenditure" incidence, Gillespie assumed "that family units benefit from 'general' expenditures in proportion to their broad incomes."[21] Unfortunately, the assumption appears to have been based on some confusion between the concepts of expenditure incidence and benefit incidence. Gillespie suggests that the general approach used in this paper to allocate benefits (which will be discussed shortly) might be characterized as "a more rigorous methodology for allocating the benefits of pure public goods among family units."[22] He applies this methodology as an alternative assumption to distribute general expenditures for the purposes of calculating expenditure incidence.[23] It appears inconsistent and inappropriate to treat general expenditures in terms of benefit incidence when one is ultimately seeking expenditure incidence.[24]

It is easy to define a parameter that gives a measure of total expenditure incidence relative to broad income analogously to the definition of a total effective tax rate. Thus, the total effective expenditure rate on families within a given money income class is defined as the total expenditure incidence on such families divided by their aggregrate broad income.[25]

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of differing family sizes on the distribution of general expenditures across different family money income classes would be small except where the average family size in an income class deviated substantially from the norm.

[21] Gillespie, *supra* note 5, at 428. It should be noted that Gillespie also derived expenditure incidence using several alternative approaches including one in which it was "assumed that family units benefit equally [from general expenditures]": *Id.* Gillespie's estimates of expenditure incidence when this alternative approach is used is from his Table A-10—Total Expenditure Incidence for Alternative General Expenditure Hypotheses Using the Broad Income Base, Canada, 1969, *supra* note 5, at 449. The effects on expenditure incidence of this approach to distributing general expenditures will be considered later.

[22] *Id.* at 428.

[23] *Id.* at 449 (Table A-10—Total Expenditure Incidence for Alternative General Expenditure Hypothesis Using the Broad Income Base, Canada, 1969, at line 5).

[24] Even if it was appropriate to consider benefit incidence in this context and apply the "more rigorous" Aaron-McGuire methodology, [See, H. Aaron and M. McGuire, *Efficiency and Equity in the Optimal Supply of a Public Good* (1969), 51 Review of Economics and Statistics 31], the results in line 5 of Gillespie's Table A-10—Total Expenditure Incidence for Alternative General Expenditure Hypothesis Using the Broad Income Base, Canada, 1969: *Id.*, would be much less regressive than those of line 4 of that table if assumptions similar to those in Part IV of this paper were made.

[25] See, note 9, *supra,* for an explanation of how component taxes can be aggregated in order to arrive at a set of total effective tax rates. The actual calculation of total effective expenditure rates involves a similar treatment of component expenditures after they have been categorised and allocated using the approach that has been dealt with in this section of the paper. As was done with taxes, component expenditures at the federal, provincial and municipal levels of government are analysed. The estimates of total expenditure incidence and total effective expenditure rates given in Table 2 of this paper follow from Gillespie's estimates of expenditure rates. However, the measure of broad income discussed in note 8, *supra,* has been used in lieu of Gillespie's measure to calculate total effective expenditure rates.

Naturally, when we turn from expenditure incidence to the analysis of benefit incidence the crucial problem becomes how to meaningfully distribute the incidence of benefits flowing from government goods and services across different income classes. Benefit incidence is defined in terms of the value or worth (in money terms) of government goods and services to the recipient tax unit. As was mentioned earlier, the value or worth of certain government goods and services, such as education, will tend to rise with the income class of the recipient. The method in the Appendix attempts to quantify this general tendency. There are numerous difficulties inherent in this method. The most serious of these are discussed in the Appendix. The benefit incidence results that follow from the Appendix are translated into total effective benefit rates in the same manner that total expenditure incidence results are translated into total effective expenditure rates. Thus, the total effective benefit rate on families within a given money income class is defined as the ratio of their total benefit incidence to their aggregate broad income.

## IV. THE COMPARISON OF TAX INCIDENCE WITH EXPENDITURE INCIDENCE AND BENEFIT INCIDENCE

Given the preceding framework, it is now possible to compare total expenditures and benefits to total taxes. The average total tax incidence is subtracted from the respective total average expenditure incidence of a family money income class. The result (average net fiscal incidence on that family money income class) indicates the degree and direction of redistribution of income effected by the public sector with respect to the average tax unit in that class.

Another measure of the degree and direction of redistribution of income by the public sector is the effective fiscal incidence rate of a given class, i.e., its total effective expenditure rate less its total effective tax rate. This is equivalent to its average net fiscal incidence over its average broad income.

Average net fiscal incidence is expressed in money terms, whereas effective fiscal incidence rates are expressed as a unitless fraction or percentage (which may exceed one or one hundred percent respectively). Quite naturally, the magnitude of either measure of fiscal incidence for a given family money income class will reflect the magnitude of redistribution of income by the public sector with respect to that class. A value of either measure greater (less) than zero will indicate a redistribution of income towards (away from) that class.

On the other hand, in order to compare average tax incidence on a family money income class, which, of course, reflects the average "cost" of the public sector to that class, with the average benefits that class derives from the public sector, we must consider the effect of benefit incidence rather than expenditure incidence. Clearly, such a cost-benefit comparison is crucial to any attempt to evaluate the overall equitability of the tax system.

Thus, substracting the average total tax incidence of a given class from its average total benefit incidence yields its average total net benefit incidence (which is in money terms). Subtracting its total effective tax rate from its total effective benefit rate yields the class net effective benefit rate (expressed

in percentage terms). For example, if the average tax unit in the class were taxed according to what the marginal benefits accruing to it from the public sector were worth to it,[26] then the net marginal benefits (which take into account taxes paid) received by that tax unit would be zero. This would be reflected by an average total net benefit incidence and a net effective benefit rate both equal to zero. If these parameters had a value greater than zero for a given family money income class, this would correspond to positive net benefits flowing to this class from the public sector. Of course, the converse would hold true in cases where the value of these parameters was less than zero.

Estimations of the parameters discussed previously are summarized in Table 2.

The patterns emerging from Table 2 are clear. For example, comparing lines 3 and 4 to line 6 we see that either measure of total effective expenditure rates discussed previously in this paper has a significantly more regressive pattern than total effective benefit rates.[27] In fact, the total effective benefit rate for tax units in the highest income class[28] is progressive with respect to that of the next highest income class.

Naturally, these results are reflected by a pattern of net effective benefit rates (line 6A) less regressive than that of effective fiscal incidence rates. The patterns of effective fiscal incidence rates in both lines 3A and 4A of Table 2 indicate that the public sector is effecting a redistribution of income primarily towards family units with money income of less than $7,000 a year at the expense of those with a money income exceeding $10,000 a year; both indicate that the expense of this income redistribution to those with a money income over $10,000 a year increases with income.[29] Naturally, the amount of income redistributed, particularly to the poorest income classes, appears greater if general expenditures are distributed evenly across all family units (lines 2, 2A, 4, and 4A) rather than in proportion to income (lines 1, 1A, 3, and 3A).

On the other hand, net effective benefit rates (line 6A) are positive for family units with money income of less than $6,000 or greater than $15,000 a year, indicating a net flow of benefits to these family units. The net effective benefit rate for the $6,000 to $6,999 income class is close to zero, indicating that the total tax burden imposed on the "average" unit in the group will tend

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[26] Taxes are set in this way under the benefit principle.

[27] Since a regressive rate is one that declines as income increases, a more regressive expenditure or benefit rate is more favourable to those in lower income brackets.

[28] This rate, however, must be treated with particular caution for the reasons mentioned in the Appendix.

[29] Gillespie suggests that this increase would probably be proportional if general expenditures were allocated as in line 3 of Table 2 since "the difference between the two effective fiscal incidence rates over the highest two brackets are [sic] probably not significant." *Supra* note 5, at 430. If this conclusion is valid, it would apply equally well to the results in line 3 of our Table 2. Furthermore, it would imply that the expense of income redistribution to those with a money income over $10,000 would increase in a progressive manner if general expenditures were allocated as in line 4 of Table 2.

## TABLE 2

| | *Family Money Income Class* under $2,000 | $2,000–$2,999 | $3,000–$3,999 | $4,000–$4,999 | $5,000–$5,999 | $6,000–$6,999 | $7,000–$9,999 | $10,000–$14,999 | $15,000– & Over | Total |
|---|---|---|---|---|---|---|---|---|---|---|
| Percentage Distributions of Family Units in Each Family Money Income Class | 12.3 | 8.0 | 7.8 | 7.6 | 8.0 | 7.9 | 22.0 | 18.2 | 8.3 | 100.0 |
| (Cumulative) Percentile Distribution of Family Units in Each Family Money Income Class | 12.3 | 20.3 | 28.1 | 35.7 | 43.7 | 51.6 | 73.6 | 91.8 | 100.0 | |
| Line | | | | | | | | | | |
| A Total tax incidence (rounded to the nearest hundred dollars for the average family unit in each family income class. These figures correspond directly to the total effective tax rates that are reproduced in line B of this table. | 700 | 1200 | 1700 | 2200 | 2600 | 3300 | 4100 | 5800 | 11600 | |
| B Total effective tax rates (rounded to the nearest percent) shown in Table 1 (line 24). | 81 | 49 | 39 | 37 | 36 | 37 | 35 | 35 | 32 | 35 |
| 1 Total expenditure incidence (rounded to the nearest hundred dollars) for the average family unit in each family money income class. These total expenditure incidence figures correspond directly to the total effective expenditure rates shown in line 3 of this table. General expenditures are distributed in proportion to the family unit's broad income. | 2200 | 3100 | 3400 | 3600 | 3600 | 3900 | 4200 | 4700 | 8400 | |
| 1A Average net fiscal incidence (rounded to the nearest hundred dollars) based on the figures from line 1 (i.e., the line 1 figure minus the figure from line A for each family money income class.) | 1500 | 1900 | 1800 | 1400 | 1000 | 700 | 100 | –1100 | –3200 | |
| 2 Total expenditure incidence (rounded to the nearest hundred dollars) for the average family unit in each family money income class. These correspond directly to the total effective expenditure rates shown in line 4 of this table. General expenditures are distributed evenly across all family units. | 3200 | 4000 | 4100 | 4100 | 4000 | 4100 | 4100 | 4200 | 5800 | |
| 2A Average net fiscal incidence (rounded to the nearest hundred dollars) based on the figures in line 2. | 2500 | 2800 | 2400 | 1900 | 1300 | 900 | 100 | -1600 | -5800 | |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 3 | Total effective expenditure rates (rounded to the nearest percent) derived directly from Gillespie's Table 2 (line 31) (*Supra* note 5, at 425) using the method of estimating broad income which is discussed in footnote 8 of this paper. General expenditures are distributed in proportion to the family unit's broad income. | 251 | 127 | 80 | 60 | 49 | 44 | 36 | 29 | 24 | 37 |
| 3A | Effective fiscal incidence rates (rounded to the nearest percent) based on the figures in line 3 (i.e., the line 3 figure minus the figure from line B for each family money income class). | 169 | 80 | 41 | 24 | 14 | 8 | 1 | 7 | –9 | 3 |
| 4 | Total effective expenditure rates (rounded to the nearest percent) derived directly from Gillespie's Table A-10 (line 1) (*Supra* note 5, at 449) using the method of estimating broad income discussed in footnote 8 of this paper. General expenditures are distributed evenly across all family units. | 376 | 162 | 96 | 69 | 54 | 44 | 36 | 25 | 16 | 37 |
| 4A | Effective fiscal incidence rates (rounded to the nearest percent) based on the figures in line 4. | 295 | 115 | 57 | 32 | 18 | 8 | 1 | –10 | –16 | 3 |
| 5 | Total benefit incidence (in notional dollar terms rounded to the nearest hundred) for the average family unit in each family money income class. These figures were derived using the approach discussed in the Appendix. | 1500 | 2300 | 2600 | 2800 | 2900 | 3200 | 3700 | 4900 | 13800 | |
| 5A | Average total net benefit incidence (in notional dollar terms rounded to the nearest hundred) based on the figures in line 5. (i.e., the line 5 figure minus the figure from line A for each family money income class). | 800 | 1100 | 900 | 600 | 300 | –100 | –400 | –900 | 2200 | |
| 6 | Total effective benefit rates (rounded to the nearest percent) derived using the approach discussed in the Appendix. | 170 | 95 | 61 | 47 | 39 | 36 | 32 | 30 | 38 | 37 |
| 6A | Net effective benefit rate (rounded to the nearest percent) based on the figures in line 6 (i.e., the line 6 figure minus the figure from line B for each family money income class). | 89 | 46 | 22 | 10 | 3 | –1 | –3 | –5 | 6 | 2 |

to be commensurate with the imputed marginal benefits accruing to it from the public sector.[30]

Net effective benefit rates are negative for family units with money income ranging from $7,000 to $15,000 a year, implying that the public sector acts to the detriment of these middle and upper middle income groups (in terms of the net flow of benefits.)[31] Probably, this detriment was more pronounced in the late 1960's than earlier in that decade,[32] although it is unclear whether or not this trend has continued into the 1970's.

One of the most striking aspects of Table 2 is that the average total net benefit incidence (line 5A) is greatest for family units with money income exceeding $15,000 a year. Thus the net benefits flowing to this income class (i.e., units with family money income in the top 8 percent of all units) is greater than for any other income class.

It is probable that the patterns emerging from Table 2 have not changed substantially in the 1970's, although there is insufficient data to verify this.[33]

This analysis of the redistributive impact of the public sector in terms of the net flow of benefits has underlined the fact that the overall redistributive equity effected by the Canadian public sector may well be less than satisfactory. It is apparent that the degree of overall redistributive equity that could be theoretically attained through the use of the tax system is substantially constrained by other objectives of the tax system that, in some circumstances, conflict with equity. Greater coordination of taxation and government expenditures would be most desirable since it would often then be possible to reduce the equitability of the tax system component of the public sector in order to facilitate the realization of other objectives while compensating for the resultant functional inequalities in the tax system by appropriate modification in the pattern and nature of government expenditures. This approach would enable the desired degree of overall redistributive equity to be realized in the most efficient possible manner.

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[30] Thus its tax burden is roughly equal to what it would be if it had been set under the benefit principle.

[31] Family units with money income ranging from $7,000 to $15,000 ranged from the 52nd to the 92nd percentile in income distribution in 1969: Gillespie, *supra* note 5, at 444 (Table A-6—Estimation of Income Concepts, Canada, 1969).

[32] This follows from the comparisons of money redistribution effected by the public sector in 1961 and 1969. The results are discussed in Gillespie, *supra* note 5, at 431-35.

[33] *Id.*

## APPENDIX: AN APPROACH TO QUANTIFYING BENEFIT INCIDENCE

Under the benefit principle, the cost of the public sector to the tax unit (tax incidence) is generally equated with the imputed benefits that the tax

unit derives from it.[1] Making a number of assumptions which will be discussed, these imputed benefits can be quantified as follows:

Let:

t(y) = tax price (set on the basis of the benefit principle) in money terms per unit of public goods to an individual with a disposable income of "y" (Thus, tax price reflects tax rates.);

Mu(y)= the taxpayer's marginal utility of disposable income, and

Mu(g)= the taxpayer's marginal utility of public goods, where "g" is a scalar measure of the "g" vector $[g_1, g_2, \ldots, g_p]$. "$g_n$" is the quantity of the "$n^{th}$" public good available to him and "p" the number of types of public goods available.

The benefit principle can then be stated in the equivalent mathematical form:[2]

$$t(y) \cdot Mu(y) = Mu(g) \text{ [It is assumed that Mu(y) exceeds zero]} \quad (1)$$

We now proceed to expand this principle into a benefit theory useful in measuring the benefits received by an individual taxpayer from the public sector.

Equation (1) implies:

$$g \cdot t(y) = g \cdot Mu(g)/Mu(y) \quad (2)$$

"g • t(y)" is the total effective taxes paid by the individual in question under the benefit principle for the benefits he derives from public goods. Thus "g • t(y)" is equivalent to his imputed benefits from the public sector. Assuming Mu(g) is constant for all income groups,[3] it follows that imputed benefits from the public sector are inversely proportional to the marginal utility of disposable income. In itself, this relationship is not very useful. However, if Mu(y) can be quantified, we can achieve some understanding of whether imputed benefits of public goods as a proportion of income rise or fall (or as Gillespie assumed for pure public goods, remain constant) as income rises. Aaron and McGuire[4] suggest that the marginal utility of disposable income can be approximated by

$$Mu(y) = ay^{-\theta} \quad (3)$$

where "a" is a constant greater than zero and "$\theta$" is the elasticity of marginal utility with respect to income.[5] Combining equations (2) and (3) and dividing by "y" yields:

$$\frac{g \cdot t(y)}{y} = \frac{g \cdot Mu(g) \cdot y^{\theta-1}}{a} \quad (4)$$

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[1] The equation of costs and benefits of the public sector under the benefit principle serves only as a point of reference. In reality, such costs and benefits are not generally equated.

[2] The mathematical approach embodied in equations (1) to (4) of this appendix was used in S. Maitel, *Is Redistributive Taxation a Myth?* (Queen's University Institute for Economic Research Discussion Paper No. 122, Mimeo, 1973) at 4-5.

[3] This assumption will be discussed shortly.

[4] See H. Aaron and M. McGuire, *Efficiency and Equity in the Optimal Supply of a Public Good* (1969), 51 Review of Economics and Statistics 31.

[5] Which is the ratio of percentage change in marginal utility of income to percentage change in income.

It can be shown that "$\theta$" can be quite reliably estimated.[6] Estimates indicate that "$\theta$" has a value of 1.55 in Canada and tends to be in this range or higher for other non-communist countries.[7] Since "$\theta$" has a value substantially greater than one (proportionally speaking), equation (4) implies that the ratio of benefits over income increases at a substantial rate as income rises. This means that if all public goods to which equation (4) applies were distributed equally among the populace (in money terms), then the tax rates set with respect to such goods on the basis of the benefit principle would have to be progressive.[8]

It is important to bear in mind the key assumptions underlying this analysis:

(1) The principle of horizontal equity is adhered to in the conventional sense so that the tax prices (which reflect tax rates) of two individuals in the same economic position under the above model, i.e. with the same "g" and "y", would be the same even if their respective preference schedules were different. This is so because of the combined effect of two assumptions. First, equation (3) makes it clear that under the model Mu(y) will not vary unless "y" does. Second, Mu(g) is assumed to be invariant with respect to all factors except "g". Failure to disregard such differences in their preference schedules over the relevant range of "y" and "g" could result in individuals in the same or similar economic positions being taxed at very different rates.

(2) It has been assumed that Mu(g) is independent of "y". This would not be appropriate for the component goods of the "g" vector which were complementary to private goods (e.g., highways and cars). The marginal utility of a given bundle of such goods would tend to increase with income rather than staying constant. Naturally, in the case of public goods where such a complementary relationship existed with private goods, the preceding model would tend to understate the benefits accruing to upper income classes.

Conversely, in the case of public goods which are substitutes for private goods (e.g., public television and movies), this bias would be reversed in cases where the consumption of the private good substitute tended to rise with income as this rise, in turn, would tend to lower the marginal utility of the corresponding public good. Thus, it would be senseless to apply equation (4) to transfer payments. Clearly, they should be excluded from the "g" vector and treated separately by equating costs to benefits in simple money terms as would be done if expenditure incidence were to be equated with tax incidence.

On the other hand, the consumption of private good substitutes would not rise substantially with income where demand for goods of that genre was

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[6] See A. Powell, *Post-War Consumption in Canada: A First Look at the Aggregates*, 31 Canadian Journal of Economics and Political Science, 1965, at 559.

[7] *Id.*

[8] Using an alternative approach, it can also be shown that this proposition follows (still with the condition that "$\Theta$" exceeds one) under a system where the total absolute sacrifice of individual (tax unit) utility as a result of taxation is equal for all units or increases with income: see R. Musgrave, *The Theory of Public Finance* (New York: McGraw-Hill, 1959) at 100.

relatively inelastic and was adequately supplied by the public sector. Excluding transfer payments, most of the specific government expenditures are made on goods such as these (e.g., education and public health). The marginal utility of such public goods would not tend to change substantially with income and thus they can reasonably be treated using the preceding analysis.

The primary difficulties in applying the model in the Canadian context are the estimation of Mu(y) and Mu(g). The model is framed in terms of the individual. For our purposes, however, the tax unit has been treated as the family rather than the individual. Adherence to micro-economic theory would generally preclude the possibility of aggregating the preference functions of the individuals within a family in order to arrive at a set of family preference functions. Fortunately, this is not necessary since under assumption (1), the model is bound by the dictates of the conventional concept of horizontal equity. There is no attempt to make inter-personal utility comparisons. The concern here is simply with obtaining approximate, relative, and average measures of Mu(g) and Mu(y) for each family money income class. Clearly, this is all that equation (3) purports to do with respect to Mu(y).

In order to obtain such a measure of Mu(g), several steps were used. First, it was necessary to find a measure of the "g" vector. To do this, transfer payments were first excluded from it for the reasons mentioned in assumption (2). It was translated into a single number for each family money income class by taking the total expenditure incidence, excluding transfer payments, for the average family in each class. To the extent that family units would like to see a re-allocation of the government expenditures currently benefitting them, this measure of the "g" vector would tend to be an overestimate. Applying this technique we arrive at the following measure of "g":

TABLE A
"g"
(rounded to the nearest hundred dollars)

| Family money income class | | | | | | | |
|---|---|---|---|---|---|---|---|
| under $2000 | $2000 –$2999 | $3000 –$3999 | $4000 –$4999 | $5000 –$5999 | $6000 –$6999 | $7000 –$9999 | $10000 –$14999 | $15000 & Over |
| 2300 | 2700 | 3000 | 3200 | 3200 | 3500 | 3600 | 3700 | 5300 |

The relative differences in these values are not substantial except for the lowest (less than $2,000 per year) and highest (greater than $15,000 per year) family money income classes. Even in the case of these extreme values, the variation from the mean does not exceed 60 percent. The curve $Mu(g)\text{-}kg^{-1}$ (where "k" is a constant) corresponds with the probable general shape of the Mu(g) curve.[9] Since the range in the relative values of "g" in Table A is not great, it appears that taking relative values of Mu(g) that are inversely proportional to these values of "g" will not introduce substantial error. Never-

[9] We would generally expect the marginal utility of public goods to decrease (at a diminishing rate) as "g" rose. Thus the Mu(g) curve is probably generally convex with respect to the origin with the co-ordinates of all points along the curve exceeding zero.

theless, the final benefit incidence results for the poorest and wealthiest income classes should be regarded with particular caution due to the wider range of the value of "g" in these cases.

Adjusted broad income is a comprehensive measure of income that takes into account the effects of the public sector. It is defined as broad income less total taxes plus total expenditure incidence. Adjusted broad income with general expenditures being distributed evenly across all family units has been used as a measure of the parameter "y". Strictly speaking, this does not conform with the definition of disposable income. For example, it is clear that the marginal utility of a given net amount of actual disposable income would generally be less to any individual who had all his needs satisfied by government services. Nevertheless, it must be conceded that the measure of "y" chosen here does have two possibly significant weaknesses. First, as discussed in Part III of this paper, it is not entirely appropriate to distribute general expenditure evenly over all family units as has been done to arrive at a measure of adjusted broad income. Second, while it is clear that Mu(y) will generally depend on such factors as various forms of imputed income, it is not clear how these factors will affect Mu(y) relative to the effect of actual disposable income. Thus, using adjusted broad income as a measure of "y" assumes that all the components of "y" have a homogeneous effect on Mu(y).

The model and assumptions in this appendix have been applied to the appropriate data[10] to derive a relative measure of the distribution of benefits from government expenditures across family money income classes. These relative values were converted into notional money terms by multiplying them all by a constant such that their sum after this multiplication would equal their total cost.[11] The respective incidences of transfer payments to which this model was not applied were then added to the resultant figures. The final

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[10] Table 2 (line 2) of this paper, as well as Table A-6—Estimation of Income Concepts in Canada, 1969, found in Gillespie, *supra* note 5, at 444. The modified measure of broad income discussed in footnote 8 in the body of this paper has been used.

[11] Thus, total imputed benefits have been equated with their total cost. In fact, it is likely that imputed benefits deviate from their total cost. Unfortunately, neither the extent nor the direction of this deviation has been ascertained. If total imputed benefits exceeded their total cost (e.g., due to a prevalence of positive externalities arising from government expenditures), then, of course, the assumption equating total benefits with their total cost would result, on the average, in the benefits flowing to tax units from the public sector being underestimated. Conversely, if total government expenditures exceeded the benefits flowing from them, then, on the average, this assumption would result in benefits being overestimated.

Even if total imputed benefits deviated significantly from their cost, the trends in the distribution of benefits across income classes would remain unchanged unless the ratio of such deviation to expenditure incidence in each income class varied substantially across income classes. It should be borne in mind, however, that although trends in the distribution of benefits may remain unchanged, errors in the estimation of their magnitude could still result in positive values of the average total net benefit incidence and the net effective benefit rate being derived where the values should be negative and vice versa. This would most likely occur, if at all, in income classes where the estimates of the average total net benefit incidence and the net effective benefit rate were relatively close to zero.

results provide a measure of total benefit incidence. These benefit incidence results are translated into total effective benfit rates in the same manner that total expenditure incidence results are translated into total effective expenditure rates. Thus, the total effective benefit rate on families within a given money income class is defined as the ratio of the total benefit incidence on them to their aggregate broad income.

Admittedly the approach used in this appendix has many weaknesses. Some of these could be remedied by further refining the approach whereas others are due to problems inherent in the quantification of benefit incidence that are not fully resolvable. Clearly, the results following from this appendix are approximate. Nevertheless, it appears likely that the pattern of the results does not deviate unreasonably from the patterns they have been designed to measure. Thus, given the crucial role of benefit incidence as a tool to measure overall redistributive equity, it would seem justifiable to apply these tentative results (at least until more refined results become available) as is done in Part IV of the paper.